

Bill Willis: International Activities and Outreach

Early contacts with Soviet physicists

- Alevtina Shmeleva (Lebedev Inst.):

“In 1975 the chief of my laboratory Alikhanian (Lebedev Physics institute, Moscow) asked me to go to the Library and find all publications about Roentgen Transition Radiation. Then to send invitations to authors of these publications to visit first TR Symposium which will be organized in Erevan (Armenia). Four physicists accepted the invitation. Among them was Bill Willis.”
- In May 1977, Bill travelled to Erevan for the Transition Radiation Symposium:



With Alikhanian



Alevtina

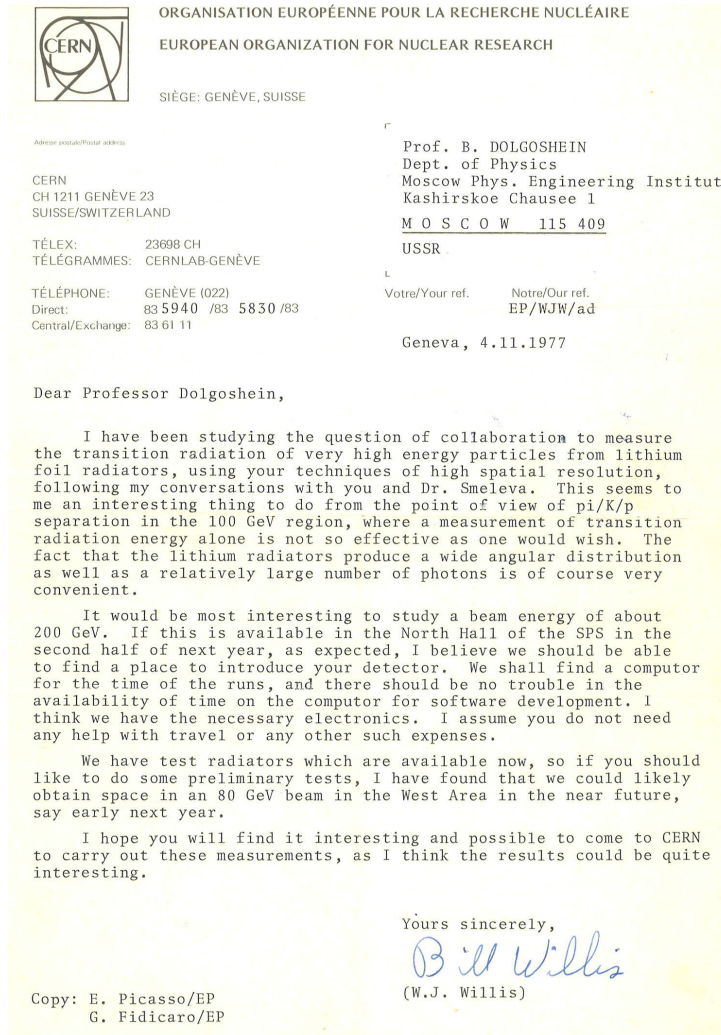
Adventures in Erevan

- Alevtina:

“Alikhanian became enthusiastic about creating real detectors using XTR. He persuaded Boris (Dolgoshein) to work on it. In 1977 in Erevan, Bill presented a paper about his ISR XTR detector with Li foils. We had some idea to propose to Bill to make some small experiment at CERN. But there was difficulty to contact him, because of presence of two keepers at the symposium looking after foreigners. Alikhanian gave me the instruction: on Sunday ask Willis to go out of the hostel early morning and I will ask one of our physicists to arrive with the car and take Willis, Boris and you to the promenade for the day. This was very nice day, and we really discussed many problems.”
- Bill reminiscing in 2010, on the passing of Boris:

“So often over the years I often think back to our first meeting in Armenia, where Boris and you and I spent the day driving around and planning, after we eluded my keeper. I always smile when I think of that day, which had such good consequences. I recall the time Boris and I were at that amusing conference in Norway in the depths of winter. I was told that they only invite people they think will be fun to that conference in the dark!”

First collaboration on TR



- First collaboration with Boris Dolgoshein (1977).
- Proposal to study transition radiation of high energy particles from lithium foils.
- Invitation for Dolgoshein and his team to come to CERN – the start of a long and fruitful program on TR detectors in several experiments at CERN.

Nal calorimetry at the Budker Institute

- Alevtina:

"I was alone at CERN in spring of 1978 to contact Bill for questions of organizing the visit of our team to CERN for work with our small prototype in an 80 GeV beam at the West area of SPS. All this business with Soviet authorities to write papers needed for our visit was long and complicated... but it was in progress. Bill asked me if it is possible to invite him to visit USSR - I said it is easy and asked what region he would like to visit. He chose Moscow and Novosibirsk, Budker Inst. When we arrived to Budker Inst., Bill very thoughtfully investigated their experiments and saw the detector using NaI crystals of high-quality. Later he asked me if it is possible to make such a detector for ISR R806 experiment."



Lake Baikal, 1981, with Chris W.

Collaborating on Nal

- Agreement with CERN to assemble facility at CERN (under Mikhail Minakov and Georgiy Piskunov):

МЕЖДУНАРОДНАЯ
ТЕЛЕГРАММА

МИНИСТЕРСТВО СВЯЗИ СССР

ПРЕПОДАВАТЕЛЬ

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Бланк № 610

Получатель: ZCZC SUS704 JADB0276 GENEVE 32/31
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Послание: HAPPY TO INFORM YOU THAT ISR COMMITTEE HAS APPROVED OUR
PROPOSAL TO DETECT PHOTONS WITH NAI ARRAY BEST REGARDS
BILL WILLIS CERNLAB

Лом. тип. П., з 169, 03.04.80.

- Involvement of Budker, Lebedev and MEPhI.
- There were skeptics, however the detector was completed on time and worked!
- (Later, around 1988, Julia Thompson became involved in experiments at Novosibirsk (VEPP-2M), working and living under sometimes harsh conditions. Julia was from Arkansas, as was Bill, and received her PhD from Yale under Bill, and Jack Sandweiss.)

R808 at the ISR

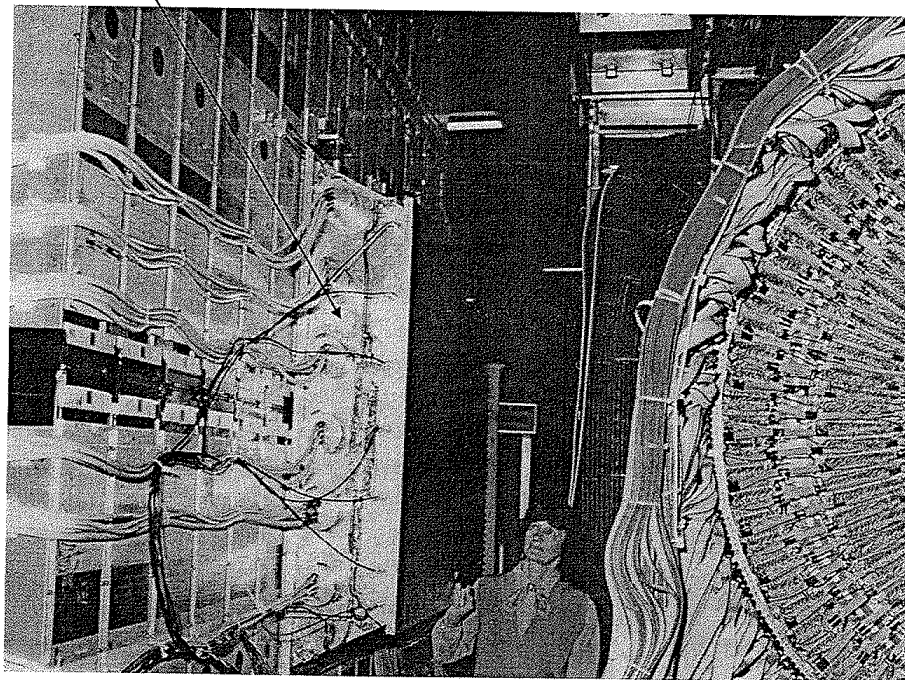


R808: A Study of Direct Photon Production at ISR (1981-1983, spokesman W.Willis/CERN)

Design and production of 2 highly segmented photon detectors with vacuum photodiode readout each consisting of 600 NaI(Tl) blocks.

The aim of this experiment was to improve the measurement of events with direct single photon production in pp and $p\bar{p}$ collisions. Higher rates and lower backgrounds compared to R806 were obtained by the use of NaI detectors in conjunction with the R807 calorimeter. The direct production of two photons were studied at both low and high p_T . The production of electrons in association with jets, and low transverse momentum electron production were also studied.

It was the only ISR experiment with the participation of Russian institutes.



Transition Radiation Detector for NA34/HELIOS



NA34 (HELIOS): Lepton Production
(1984-1989, spokesman W.Willis/CERN)

Design and construction of Transition Radiation Detector (TRD) used for
electron identification at the trigger level.

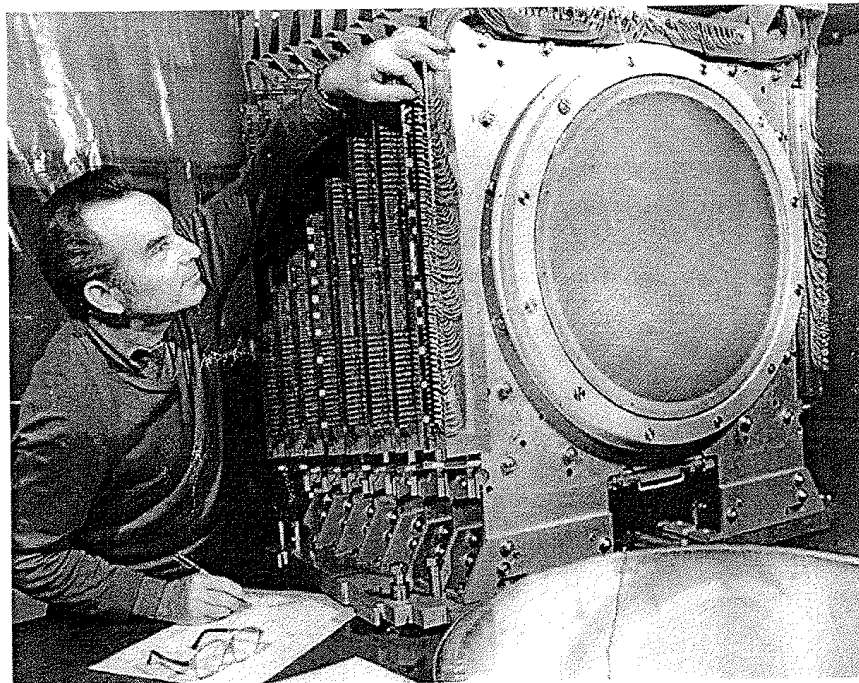
plus reconfigured NaI calorimeter from R808

The experiment was aimed to settle the open questions in the hadronic production of electrons, muons and neutrinos. Careful studies were carried out on e/μ universality, anomalies in the production of single leptons, the contribution of charm decay to lepton pair production and the “anomalous” low mass pairs.

The team from MEPHl also participated in the complimentary experimental programme of NA34:

NA34/2 – Study of High Energy Densities over Extended Nuclear Volumes via Nucleus-Nucleus Collisions at the SPS (1984-1988)

NA34/3 – Measurement of Low Muon Pairs in Sulphur-Nucleus Collisions with an Optimized HELIOS Muon Spectrometer (1988-1990)



Subsequent collaboration with Russian and Eastern Bloc scientists



CERN-DRDC
90-38

CERN LIBRARIES, GENEVA



SC00000693

CERN/DRDC/90-38

DRDC/P8

29th August 1990

DETECTOR R&D PROPOSAL

INTEGRATED HIGH-RATE TRANSITION RADIATION DETECTOR AND TRACKING CHAMBER FOR THE LHC

V.A. Polychronakos
Brookhaven National Laboratory, USA

H. Beker, R.K. Bock, E. David, C.W. Fabjan*, J. Pfennig,
M.J. Price and W. J. Willis
CERN, Geneva, Switzerland

Y. Ershow, I. Golutvin, N. Gorbunov, V. Karzhavin, S. Khabarov,
V. Khabarov, A. Liubin, V. Peshekonov and D. Smolin
JINR (Dubna), USSR

T. Akesson
University of Lund, Sweden

V. Chernyatin, B. Dolgoshein**, A. Konstantinov, P. Nevski,
M. Potekhin, A. Romaniouk, S. Smirnov and V. Sosnovtsev
Moscow Physical Engineering Institute, Moscow, USSR

I. Gavrilenko, S. Maiburov, S. Muraviev and A. Shmeleva
P.N. Lebedev Institute of Physics, Moscow, USSR

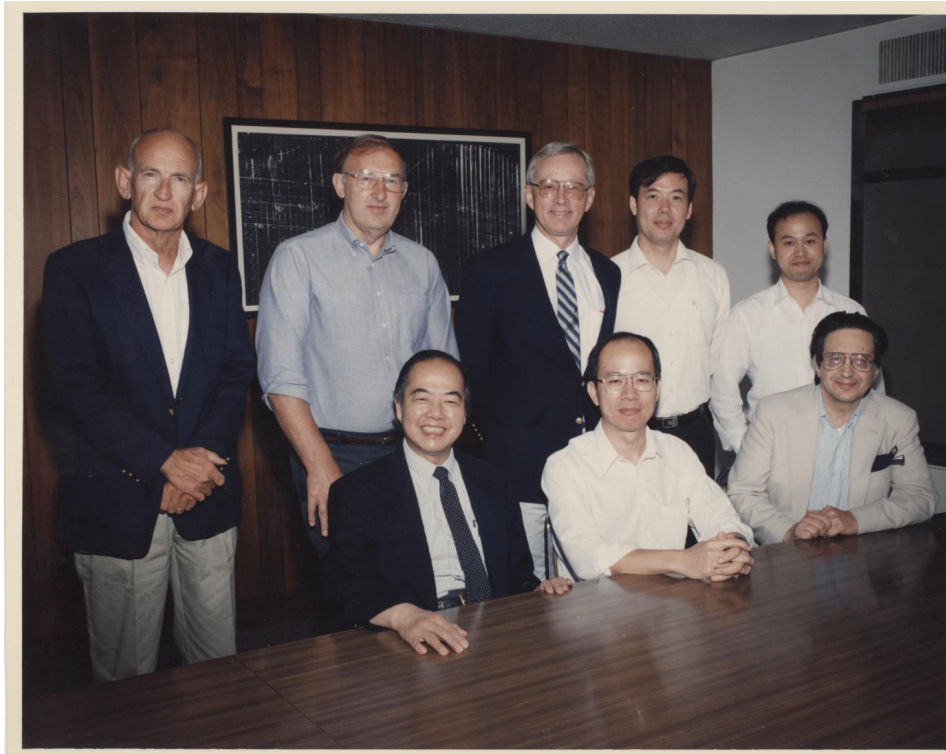
SUMMARY

The development of an integrated transition radiation detector (TRD) and charged-particle tracker for use in an LHC detector is proposed. The purpose of such a detector is to identify electrons efficiently, while rejecting the potentially very large background, originating mainly from overlaps between an energetic π^0 and a charged hadron and from electron pairs. A low-mass structure of radiator materials and proportional straws will generate and detect transition radiation X-rays and will track charged particles. Readout for the straw signals, and trigger processors correlating the TRD signal with external detectors, will be developed. A small prototype, sufficient to contain a high-energy jet and followed by a fine-grained calorimeter, will be tested. An engineering prototype will be constructed to verify the design for a large detector.

- Bill brought a number of Russian and Eastern Bloc scientists to the US, among them:
 - Pavel Rehak
 - Mikhail Leltchouk
 - Michal Seman
 - Graduate students through Boris (Maxim Potekhin, Sasha Medvedev)
- Development of TRT for ATLAS.
- Bill was a member of the Scientific Policy Committee of the Russian Ministry of Science.

Relationships with China

- Bill's long-time friendship with T.D. Lee, and his key role in RHIC, naturally led to close ties with China on many occasions...

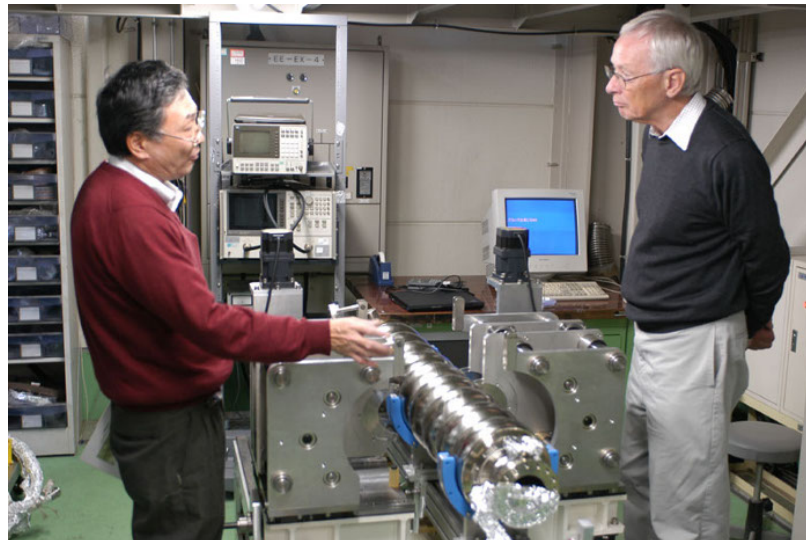


Chinese delegation at BNL, early 1990's

- Bill was in China during the Tianenmen Square protests in 1989.

And with Japan...

- In the 1980's, Bill met with Kozi Nakai, which led to Kozi's student Hideto En'yo subsequently working with Bill as a postdoc at CERN (NA34).
- Significant Japanese involvement in CERN experiments NA34, NA44,...
- Bill had a long friendship with Kenzo Nakamura, and Bill and Lindsey visited Kenzo's home during their trip to Japan.
- And of course with the ILC (Akira Yamamoto in particular), where Bill's influence was very significant.



With Kenji Saito (KEK)

Education & Outreach

- Soon after Bill came to Columbia, he began including Columbia undergraduates in his research programs – summer students at CERN (NA44).
- He made contacts with local high schools, bringing students to Nevis during the school year and each summer – Bill was characteristically generous with his time.
- With NSF support of the US in the LHC, a growing focus on outreach.
- QuarkNet was launched in 2000, funded by NSF and DOE – Columbia was one of the first sites (now 50+).
- Bill worked closely with ATLAS colleagues at Hampton University (Keith Baker, Ken McFarlane, Ken Cecire), which also became a QuarkNet site.

The QuarkNet success story



Stories of QuarkNet Teachers and Students



[QuarkNet Home](#) - [Information](#) - [Calendar](#) - [Contacts](#) - [Projects](#) - Forms: [Eol](#) - [Teachers](#)



QuarkNet: Helping Develop America's Technical Workforce

Centers at **53** universities and labs

18 HEP experiments

475 high schools in **28** states

60,000 students per year

The focus of QuarkNet is to involve teachers and students in our experiments:

Teachers do research with us and bring that excitement and experience to their classrooms.

Students analyze data in their classrooms.



Jack K. Willis in Muleshoe, a far west Texas rural farm area, drives quite a way to QuarkNet, usually staying in a hotel at his own expense.

"QuarkNet has allowed me to expand my particle physics knowledge tremendously. . . It has also afforded me an opportunity to share this high energy physics with my students and to get some of them involved in individual research especially in cosmic ray detection.

I really believe that I am a much more well-rounded teacher because of my association with the people involved in QuarkNet and not just the knowledge.

What a privilege it has been to be associated with Fred Olness and his crew at SMU, Randy Ruchti and his colleagues at Notre Dame and Nural Akchurin and his colleagues at Texas Tech. Rubbing shoulders with these great researchers has afforded me opportunities that I never dreamed of obtaining.

And the association with all of the great teachers that have been involved in the QuarkNet Workshops at each of these institutions has created a wonderful network of individuals I can contact.

This has truly been one of my greatest experiences in my teaching career.

QuarkNet is getting students excited about science and involved in classroom science investigations . . . by getting scientists and teachers working together.

Project Contact: [Tom Jordan](#)
Web Maintainer: quarknet-webmaster@fnal.gov
Last Update: June 17, 2010
<http://quarknet.fnal.gov/stories.shtml>

Summertimes at Nevis

- Bill's interest in novel detectors had led him to explore the use of "electron bubbles" (cavities) in the super-cryogenic liquids He, Ne.
- Interesting possibilities for low energy neutrino interactions, using slow drift in TPC mode.
- R&D on the eBubble project, also with BNL, involved QuarkNet teachers, undergraduates, high school students.



Forging connections with Africa

- Marv Goldberg at NSF was very interested in promoting research/education partnerships with African countries.
- Initial contacts to South Africa led to hosting of SA teachers in the US, including Hampton, Pittsburgh (Julia), visits to Fermilab (QuarkNet), ...
- Teachers helped design a much-needed physics outreach program in SA.



Nevis, 2001

Travelling outreach programs to underserved high schools in S. Africa

- Pilot program in 2002, supported by NSF, to township and rural schools around Johannesburg (Gauteng province):



Travelling outreach programs to underserved high schools in S. Africa

- With the critical support of the University of the Witwatersrand (Simon Connell) and the Gauteng Dept. of Ed. (Cynthia Malinga), the program quickly prospered.
- Transfer to fully-local, and sustained, operation in 2005 – the program continues today, in expanded form, run through the Johannesburg SciBono Science Centre.



Travelling outreach programs to underserved high schools in S. Africa

- Meanwhile in and around Cape Town, under the committed leadership of Julia Thompson...
- Also with US college students, and partnerships with local universities and Education Departments.



2002

Building connections with 'Wits'

- Initial outreach-based connections with the University of Witwatersrand in Johannesburg led to increasing interest in becoming more involved at CERN (LHC).
- The group of Simon Connell at 'Wits' was already active at CERN, using diamond in beamlines.
- The growing computing grid effort for the LHC experiments offered an opportunity to extend the grid to S. Africa: with support from the Open Science Grid a cluster was established at Wits, eventually becoming a Tier 3 ATLAS facility.
- With the support of Peter Jenni and John Ellis, Wits and the Univ. of Johannesburg joined ATLAS in 2008.

- S. Africa is now a full participant in ATLAS; close ties also with BNL (Ketevi Assamagan):



SA Sunday Times, 2008

From friends not present...

“Bill was my mentor at all levels and one of the persons I admired best! He was a source of inspiration for me. Except from his cleverness and scientific judgment, he was gleaming a calmness and deep humor. One of his main characteristics was also his democratic behavior and justice. I am very sorry I cannot attend... I will be mentally present.”

Christina Kourkemelis, Univ. of Athens

“I remember how in November 1982 Bill invited me for a Thanksgiving dinner at his home and explained how important this day is for Americans. He added that on this day there is a tradition to invite people who are far from their home. I appreciated that very much. Please pass my best to the family and friends of Bill.”

Simon Eidelman, Budker Inst., Novosibirsk

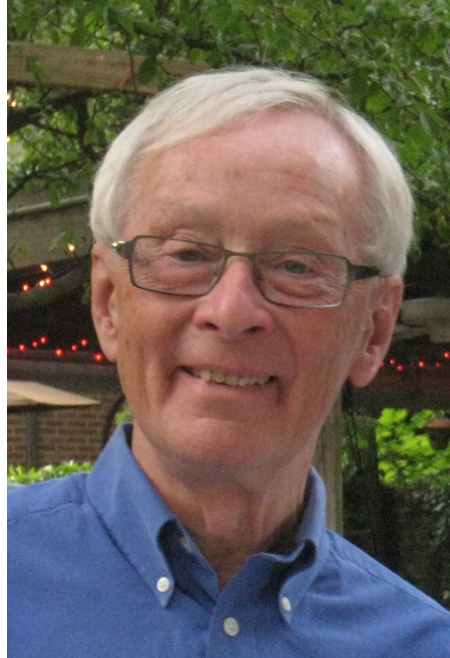
“Unfortunately I am not able to come to his Day due to the conflict with Asian Nuclear Physics Meeting. Please pass on my best regards.”

Shoji Nagamiya, RIKEN, J-PARC, KEK

“Please transmit my appreciation and best wishes at the BNL Symposium on April 26th honoring Bill Willis.”

TD Lee, Columbia, on an extended trip

It has been an extraordinary privilege
and honor...



Thank you!

With thanks to:

Simon Eidelman, Chris Fabjan, Christina Kourkemelis, Shoji Nagamiya, Veljko Radeka, Alevtina Shmeleva